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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/496,506	02/02/2000	Munir H. Nayfeh	1201.63407	6344

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EXAMINER

CRANE, SARA W

ART UNIT PAPER NUMBER

2811

DATE MAILED: 11/05/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/496,506

Applicant(s)

NAYFEH ET AL.

Examiner

Sara W. Crane

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 October 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 4-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

The finality of the Office action of 4 June 2002 is withdrawn. A new final rejection is entered below.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-2 and 4-8 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. With respect to claims 1 and 8, no technique for making a buried gate layer of silicon nanoparticle having a diameter of approximately 1 nm is taught in the specification. With respect to claim 5, no technique for making 1 nm diameter silicon nanoparticles implanted as a buried gate layer has been taught in the specification. Applicant's representative argued at length during the interview of 10 September 2002 that the no prior art teaches the 1 nm silicon nanoparticle, and that reference must be made to Applicant's specification to find a teaching of such nanoparticles. If this is the case, then Applicant's specification must contain enough of a description of how to make such nanoparticles, so that one of ordinary skill could practice the invention claimed. No such description appears to be included in the specification.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 4, 5, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. in view of Forbes and Pankove et al.

With respect to claim 1, Chen et al. figures 8 and 9 teach a single electron transistor device having a buried gate layer of quantum dots (column 7, line 43). Column 4, line 55, teaches the 1 nm dimension for the quantum dot. The reference therefore anticipates claim 1, and anticipation is the epitome of obviousness. Alternatively, it would have been obvious to form the quantum dots of figures 8 and 9 of 1 nm dimension, because this is exactly what is taught at column 4, line 55. Forbes provides an alternative teaching of a transistor having 1 nm diameter silicon nanoparticles formed in the gate insulator. See figure 3 and column 4, line 65. Therefore, Forbes also anticipates claim 1. Alternatively, it would have been obvious to form the quantum dot film of Chen figures 8 and 9 as taught by Forbes, in order to achieve the larger bandgap due to confinement taught by Forbes at column 4, lines 21-23. Pankove et al. column 5, line 6, teaches quantum dots of about 10 angstroms in both diameter and depth, and provides further evidence that such dots were known in the art prior to Applicant's invention. One of ordinary skill could therefore implement the Chen teaching about 1 nm quantum dots, without reference to Applicant's specification.

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With respect to claim 4, the energy spacing recited would be inherent in silicon particles of 1 nm diameter. With respect to claim 5, Chen et al. teaches in the abstract that one or more holes can be created in the nanoparticle. Conduction "across the source and the drain" would be exactly as for Applicant's transistor. With respect to claim 8, both Chen et al. and Forbes teach nanoparticles in an insulator layer separate from the tunnel layer.

Claims 6 and 7 rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 1, 4, 5, and 8 above, and further in view of Matsumura et al.

Applicant of light to move carriers between a quantum box and channel is motivated by Matsumura et al., as noted in the Office action of 4 October 2001. (Examiner assumes claim 6 depends from claim 5, rather than claim 4.)

Conclusion

Applicant's arguments filed with respect to the pending claims have been fully considered but they are not persuasive. Applicant argues that prior art quantum dots are three dimensional, and therefore could have any shape or size dimension. Examiner agrees that quantum dots are not invisible, or non-existent, and that quantum dots have some dimension in all three directions. Examiner disagrees that such dimensions are arbitrary, however. A quantum dot is a structure that provides for quantum mechanical confinement in all three spatial dimensions. If one of the three

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dimensions, for example, is much larger than the other two, then the energy levels for particles traveling in that direction would be closely-spaced with respect to the energy levels of the other two dimensions. The particles would therefore not be confined in that direction, and would therefore not be considered quantum dots. A structure can meet the definition for a quantum dot only if the dimensions in all three directions are approximately the same. At any rate, the prior art cited above provides ample teaching of quantum dots having approximately 1 nm dimension in all three directions.

The prior art newly-cited above was cited to address the limitation of 1 nm diameter silicon nanoparticles. This limitation⁴ was added by amendment of 28 February 2002. Applicant's amendment therefore necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

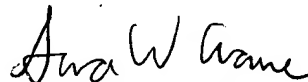
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to S. Crane, whose telephone number is (703) 308-4894.

The fax phone number for this Group is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist, whose telephone number is (703) 308-0956.



Sara W. Crane
Primary Examiner
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